

WHAT IS CLAIMED IS:

1. An ultrasonic imaging system comprising:
 - a probe including a single crystal transducer array exhibiting a transducer band;
 - 5 a transmit beamformer coupled to elements of the transducer array and controlled to cause the probe to transmit two or more beams during the same transmit interval in different beam directions, wherein each beam occupies a substantially different bandwidths of the transducer band;
 - a receive beamformer coupled to process two or more receive beams in response
 - 10 to the transmitted beams during the same receive interval, the receive beams exhibiting steering directions corresponding to those of the transmitted beams;
 - a filter coupled to the beamformer which acts to filter the receive beams;
 - a signal processor coupled to the filter;
 - an image processor coupled to the signal processor; and
 - 15 a display coupled to the image processor which displays an image formed from components of the receive beams.
2. The ultrasonic imaging system of Claim 1, wherein the transmit beamformer further comprises a pulse encoder which acts to cause the probe to transmit
- 20 differently coded transmit pulses in the different beam directions.
3. The ultrasonic imaging system of Claim 2, wherein the pulse encoder comprises one of a chirp pulse encoder, a Barker code encoder, or a Golay code encoder.
- 25 4. The ultrasonic imaging system of Claim 1, wherein the filter comprises bandpass filters exhibiting passbands corresponding to the different bandwidths.
5. The ultrasonic imaging system of Claim 1, wherein the filter comprises
- 30 two or more matched filters matched to the characteristics of the transmitted beams.

6. The ultrasonic imaging system of Claim 2, wherein the filter comprises two or more matched filters matched to the characteristics of the coded transmit pulses.

7. The ultrasonic imaging system of Claim 5, wherein the matched filters exhibit passbands respectively matched to the bandwidths of the anticipated received signals, and exhibit phase response characteristics which are the respective complements of the phase characteristics of the anticipated received signals.

8. The ultrasonic imaging system of Claim 1, wherein the filter comprises two or more mis-matched filters exhibiting characteristics chosen in considerations of the characteristics of the anticipated received signals.

9. The ultrasonic imaging system of Claim 1, wherein the bandwidths of the beams are substantially non-overlapping in frequency.

10. The ultrasonic imaging system of Claim 9, wherein the filter comprises a bandpass filter.

11. The ultrasonic imaging system of Claim 1, wherein the bandwidths of the beams are fractionally overlapping in frequency.

12. The ultrasonic imaging system of Claim 11, wherein the transmit beamformer uses differently coded pulses to transmit the beams, and wherein the filter comprises a matched filter matched to the coding of the beams.

13. The ultrasonic imaging system of Claim 1, wherein the beamformer comprises a multiline beamformer.

14. The ultrasonic imaging system of Claim 13, wherein the multiline beamformer acts to produce two or more beams substantially aligned with each of the steering directions of the transmitted beams.